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Knopp

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(54) **METHOD AND APPARATUS FOR PRODUCING DIGITAL ORTHOPHOTOS USING SPARSE STEREO CONFIGURATIONS AND EXTERNAL MODELS**

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(57) **ABSTRACT**

A method and system for producing digital orthophotos from imagery acquired as full or sparse stereo. The orthophotos can be produced in a variety of map coordinate systems without the need to convert or recompute DEM or photogrammetric solution data. In one embodiment, a two dimensional, planimetric free-network solution, utilizing arbitrary datum definition constraints, is used to provide a transitory coordinate system that is used to facilitate the image measurement process. It is utilized as a preliminary step to refine apriori block layout information to facilitate point picking and to provide general quality control capabilities before undertaking a rigorous 3D photogrammetric adjustment. In place of a general map conversion transformation, an identity transformation can be used, so that map coordinates and world coordinates are identical. With this process, given DEM data and photogrammetric solution data in a particular coordinate system, the orthophoto image data can be produced in any map coordinate system. In one embodiment, all geometric coordinate transformations are performed prior to performing the image intensity interpolation operation. Thus, only one image intensity interpolation operation is performed, using the geometric coordinate data. In another embodiment, a network constraint is introduced to the block adjustment process that assumes an average vertical direction in order to support the process of self rectification.

30 Claims, 49 Drawing Sheets